



First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER.

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport.

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM.

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independent of whatever may be the obligations of the Government on their behalf. It will be apparent that the mere opening of the subscription list with Messrs. Michelin's gift—generous and welcome as it is—at the head of the donations, will not in itself ensure adequate success. The Air Services Fund, to be successful, must be such as to provide a great national asset by enabling young men to enter one or other of the flying services with the full knowledge that they will be taken care of should they meet with injury in the carrying out of their work, or that there will be no question as to their dependents being provided for to some extent in the event of their meeting death while on duty, a risk, in addition to the special dangers to which they are exposed, which they share with their comrades who are serving King and Country in other directions. There is no question that men of exceptional ability and character are needed in the flying services, and it will be a loss to the country if some of the best are obliged to hold back by reason of taking thought of their home responsibilities.

EDITORIAL COMMENT.

A National Air Services Fund.

All associated with the aircraft movement will, we feel sure, have read with the greatest pleasure and satisfaction the announcement made in our last issue that the Committee of the Royal Aero Club, at the suggestion of the Admiralty and the War Office, had decided to organise and administer a general fund for the benefit of the Royal Naval Air Service and the Royal Flying Corps.

It is an open secret that the credit for the idea of the institution for this particular fund is due to the thoughtfulness of Messrs. Andre and Edouard Michelin, two generous men who, notwithstanding the great help they have already given to the aviation movement in this country, have undertaken to further add to that practical support by opening the fund with a subscription of £1,000. The value of the air services in the present war is so great that nothing but a good round total should be looked for, so that those who, with more or less disastrous results to themselves, have without hesitancy carried out the most daring exploits with such far-reaching results, together with those who are associated with them, may feel that there is a solid solace awaiting them or their kith and kin, altogether

The Club Must Lead.

To ensure success the Fund needs a strong official fillip, and it is on these grounds that we applaud the determination of the Club Committee to call together the members at a special meeting on Monday next, so that they may have opportunity of endorsing the recommendations of the large majority of the Committee that the Club shall second the starting donation of the Messrs. Michelin by subscribing a similar sum from the accumulated reserves of the Royal Aero Club. While the Messrs. Michelin are to be heartily thanked for the efforts and support they have given to the Fund, we feel strongly that its success or failure will depend on the energy shown by the organising body. The unanimous gift of £1,000 by the Club would go far in giving to the Fund a National—not to say Imperial—character. It would demonstrate to the public—who have so much to be thankful to our flying forces for—that, the Fund being one that is worthy of support in such solid form by the Governing Body in Aeronautics, one and all should rally round the Royal Aero Club flag, and make the ultimate total of such dimensions as to in a small degree recognise in kind the inestimable value of the heroic work carried out by the men of the "Fifth Arm." The ball thus set rolling would bring in supporters at a much more rapid rate than would be possible were any lukewarmness shown

by the Royal Aero Club as a body in approving such a splendid object put forward by the Committee of their Club in its rôle as a society of encouragement.

It has been suggested by the Finance Committee that the financial position of the Club is not such as to justify any contribution to the Fund. While we have no definite knowledge as to the condition of the Club from the financial point of view, yet we imagine, while having in mind that in the past it has not been behind in making necessary expenditure for the benefit of the movement generally it has wisely husbanded part of its resources, that the amount standing to its credit should be fully equal to the proposed subscription, although possibly the Finance Committee—as the Finance Committee—prefer to leave the responsibility of saying so to the members themselves.

In any case it must be remembered that one of the main objects of the Club is that of being a Society of Encouragement, and we can imagine no better way of affording practical proof of that position in the aviation movement than by giving its whole-hearted and material support to such a unique and deserving cause.

Subject to the withdrawal of such a sum not actually placing the financial position of the Club in a state of jeopardy, we feel that the approving action of the Club, at this critical period of the world's history, will not only be appreciated and give a strong fillip to the way the Fund will be supported by the public, but that the Club will, within a very short time, meet with more than a commensurate reward in the accession of members and the importance that, as we intimated in a recent issue, the Club is, in our opinion, bound to secure as a result of the unparalleled work that has been done by the Air Services—both Naval and Military—in assisting in the removal of that great menace of the world's peace—German militarism.

* * *

Whole-hearted Support Needed.

In thus expressing our views, we do not overlook the suggestion that has been mooted in the past that the Club should prepare for its future extension by the acquisition of more suitable Club premises. While these will undoubtedly be necessary, yet for the moment, this scheme is one that is, relatively, of secondary importance to the immediate work that can be accomplished by the Fund. And, as we have said, the increased status and membership of the Club that is likely to accrue when the War has been brought to a successful termination will render the question of a more suitable habitation for the Club one not difficult of solution.

We feel certain that given such a send-off, the Fund will meet with the hearty and practical support of the public, who, realising, as they now undoubtedly have, the valuable work that has been rendered by both branches of our Air Services in defeating the long-contemplated plans of the enemy, will be glad to have an opportunity of showing, by financial assistance, their keen appreciation of this newest, but not the least important, branch of our naval and military protection.

The members, by resolving to make the gift of £1,000 from the Club's funds, will not only be doing the right thing at the right moment, but will also thereby be signifying their appreciation of the unselfish work that is being so consistently and perseveringly done on their behalf by the members of the Committee, which includes a number of well-known men, who know the needs of aviation and of the air services as few can know them, and who give up much of their valuable time towards the

advancement of the movement in general and in the interests of the Club in particular.

From enquiries we have made, we have good reason to know that if the Club as a body decided to head the list of subscriptions to the Fund with the suggested contribution of £1,000, this will be immediately augmented, not only by the £1,000 promised by Messrs. Michelin, but by personal subscriptions from individual members of the Committee of the Club to the extent of close upon £1,500.

We may mention *en passant* that the Club is on the point of issuing its thousandth Aviator's Certificate; no less than 983 such certificates had been granted up to the 4th inst., and probably by the time these lines are in print the one bearing the number 1,000 will have been passed. Such an event needs to be signalled in some special way, and what better way could there be, at a time when indelible marks are being made in the world's history, than by the Royal Aero Club starting the National Air Services' Fund by this subscription of £1,000?

A suggestion arises that, assuming the Club decides to make this contribution to the Fund, the Committee should consider whether it would be feasible to allocate specified amounts to individual risks of flying men who, on the strength of the existence of the Air Services Fund, decide to volunteer for service at the front. In this way the Fund would become a definite insurance on the life of the flying officer, and would relieve those left behind from one of their many anxieties. This is a matter, however, that can be settled later. In the meantime the great thing is to get the Fund launched in a manner worthy of the Club. We therefore trust that every possible member will endeavour to attend the special meeting on Monday next, and, by his vote, endorse the opinion of the Club Committee thereby enabling the Club to do the dual service—that of supporting our flying personnel in both the Navy and the Army, and of demonstrating in a practical form the necessity for the existence, present and future, of the Royal Aero Club.

* * *

The Proposed "Industrial Army" Badge.

During the past few weeks we have received a large number of letters, both from employers and employees in all parts of the country, welcoming the campaign we have inaugurated in pointing out that those workmen who have stuck to their posts, and so enabled the very necessary supplies of all kinds to be kept up to meet the Naval and Military requirements, are serving their country just as much as the man in uniform, and consequently are deserving of official recognition. At the same time, as our Correspondence Columns last week indicated, there is at least one who holds that it is necessary for every man to take up arms.

Everyone is, of course, entitled to his opinion, but the more we reflect on the matter, the more are we convinced of the vital necessity of keeping a large reserve of able-bodied and skilled men at their normal employment. We have already shown that this is recognised by those at the head of the Admiralty and the War Office, and as time goes on, further evidence is forthcoming that our view is gaining a wide circle of advocates—from His Majesty the King downwards—as witness the following message from King George, read by Dr. Macnamara, M.P., Financial Secretary to the Admiralty, during his visit to Palmer's shipyard, Jarrow, on Monday last, when, addressing the workmen, he thanked them on behalf of

the Admiralty for the efforts they were making to complete Admiralty work :—

"His Majesty appreciates the loyal and untiring service which is being rendered to the country by the skilled workmen in the great shipbuilding and armament firms. His Majesty greatly admires that spirit of patriotism which arouses in them the desire to enlist and fight at the front; but His Majesty wishes to remind them that by the work they alone can most successfully perform they are assisting in the prosecution of the war equally with their comrades serving by land and sea."

Dr. Macnamara himself, during his speech to the workmen, said: "I have come here to say thank you in the name of the Board of Admiralty. . . . By your efforts you have assisted materially in increasing the strength and readiness of the fleet. . . . To-day, you men in overalls, just as your brothers in khaki and blue, stand between the British Empire at home and abroad and the grip of a savage, relentless ruthless militarism."

Again, in the course of a long letter in the *Times* the other day, in which he deals with the question of voluntary *v.* compulsory service, Earl Selborne points out that:

"If the day comes when the nation is satisfied that it must introduce the compulsory system to finish the war, that moment will

surely be a critical moment. It is perfectly impossible to obtain compulsory service by, as it were, merely pressing the Parliamentary button, without producing chaos in our national organisation. There are very many men doing work to-day at home which is quite as essential for the success of our arms as service in the ships or in the trenches. No skilled man ought to be taken away from any of those trades which manufacture the equipment of war, battleships, guns, rifles, aeroplanes, cartridges, &c., nor can one man be spared who makes soldiers' boots or soldiers' clothing. Only a certain proportion of the men can be taken from the railways or the coal mines, and I make no pretence of offering an exhaustive list. What men can or cannot be taken under a compulsory system is, in fact, not a simple but a very complicated question, and what I urge is that the whole of that question should be carefully studied by the Government."

Thus, the point we have for some time urged is becoming more widely accepted, and, in view of this, we cannot see how the Admiralty and War Office can hold back from deciding to issue to those civilians who are doing their full share of National Service some badge to indicate to the public that, although they have not enlisted as soldiers or sailors, it is because they are doing equally valuable work as members of the necessary Industrial Army. After His Majesty's message there need be no delay in issuing that badge.

✠ ✠ ✠ AIRCRAFT WORK AT THE FRONT.

IN the despatch from an "Eyewitness" present with the British Headquarters, dated December 10th, and issued on Tuesday through the Official Press Bureau there were the following references to the work of aircraft :—

"A German aviator dropped six bombs on Hazebrouck (on December 6th) with little effect.

"The weather has been very wet and much warmer during the last four days. There has also been a high wind during most of this period, but our aviators have succeeded in making several valuable reconnaissances."

In the supplementary despatch from "Eyewitness," dated December 13th and issued on Wednesday, there was the following :—

"The weather has on the whole been rainy and very windy, though Saturday was one of the finest days we have had for some time. Over large areas, also, the clouds have hung as low as 400 ft.

"Since the German anti-aircraft guns make fairly accurate shooting up to a vertical range of 8,000 ft., to say nothing of the rifle and machine-gun fire, it can be appreciated that the conditions have not been ideal for aerial reconnaissance.

"On the other hand, a low-lying layer of clouds may not be such a disadvantage to errands of destruction. It may be thick enough to prevent the observation and identification of comparatively small objects, such as those whose presence it is usually sought to discover, but

not to hide the features of the country, such as towns, villages, and rivers, and so prevent an aviator orienting himself by sight.

"When this is so he can fly above the cloud bank until he arrives over the point which he wishes to attack, and then drop his bombs unseen from below, or he can descend and drop them from a lower altitude.

"It is easier to discern large objects on the ground through cloud than it is for those below to see an aeroplane through the same. The moral effect of 'bolts from the blue,' or rather from the blank grey, is somewhat greater than when the destroyer is actually seen."

A French official message issued in Paris on Wednesday stated :—

"In spite of the weather our air squadrons during the last two days flew over the enemy's lines at less than 3,280 ft. altitude, successfully dropping several bombs in the region of the wood of Houthulst (nine miles north-east of Ypres) and elsewhere."

In an official narrative of events, in connection with the operations of the 3rd Cavalry Division in France, published in the *Times* of December 16th, there was the following :—

"October 14th.—Shortly after leaving Ypres this brigade, assisted by rifle and revolver fire from everybody in Ypres, succeeded in bringing down a Taube aeroplane. Its pilot and observer escaped into some woods, but were captured later on in the day."

✠ ✠ The Roll of Honour.

IN the list of casualties in the British Expeditionary Force, issued on the 11th inst., there were the following officers of the Royal Flying Corps :—

The following officers not previously reported as prisoners are now reported through the United States Embassy to be prisoners of war :—

Lieutenant V. S. E. Lindop.
Lieutenant H. G. L. Mayne.
Lieutenant K. Rawson-Shaw.

The Lights of London.

THE following announcement was issued through the official Press Bureau on Monday :—

The Secretary of State's Order for the Metropolitan Police District and the City of London, which was about to expire at the

end of the present month unless renewed, has been superseded by a fresh order.

This differs from the previous order in two particulars only :

1. The use of any lights whatever for outside advertising, or for the illumination of shop-fronts, is now prohibited. Formerly only "powerful" lights were prohibited, and the uncertainty as to what lights were "powerful" led to evasions of the order.

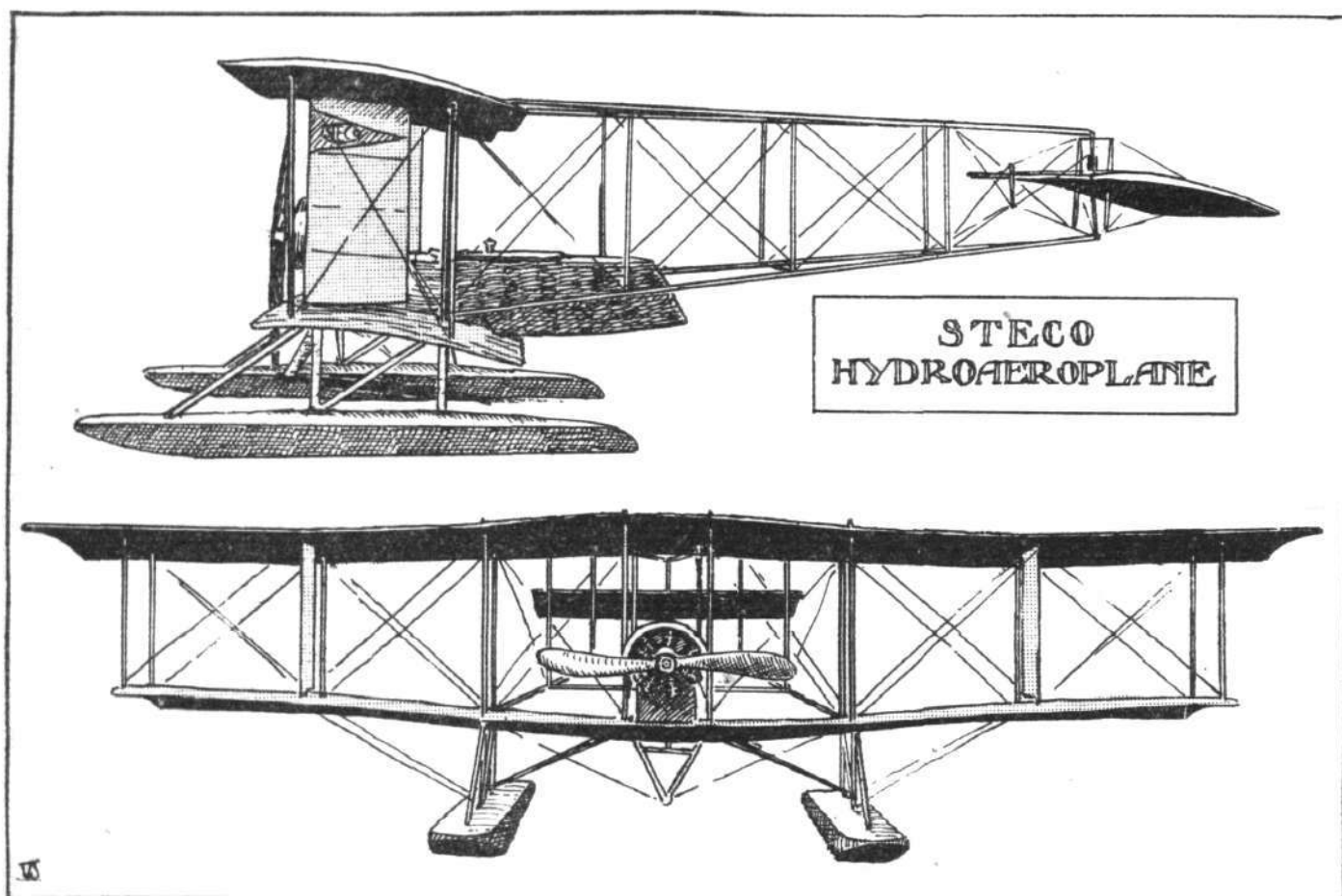
2. An entirely new provision is inserted, requiring all vehicles to carry, in addition to any headlights which the existing law requires, a lamp which shows a red light to the rear. Experience has shown that this is necessary in the present condition of the streets to protect vehicles from being run into from behind.

It should be particularly noted that this requirement extends to cycles and handcarts as well as to other vehicles. The red-glass "reflectors" which are so largely used by cyclists are no longer sufficient, but a lighted lamp must be carried which shows red to the rear.

EARLY AMERICAN STABILITY BIPLANES.

Two interesting examples of early attempts at stability aeroplanes hailing from America are the Steco and Carey biplanes, illustrated by the accompanying sketches, and incidentally it may be noted that it is claimed for both these machines that they circumvent the Wright aeroplane control patents. The Steco biplane was designed during the latter part of 1910, a favourable verdict having been expressed by the late Octave Chanute, to whom the drawings were submitted. In the spring of 1911 the machine was completed, but owing to the lack of a suitable motor no actual tests were made. It was not until the autumn of 1913 that a 50 h.p. Gnome engine was obtained, and as it was decided to test the machine over water a pair of Burgess floats

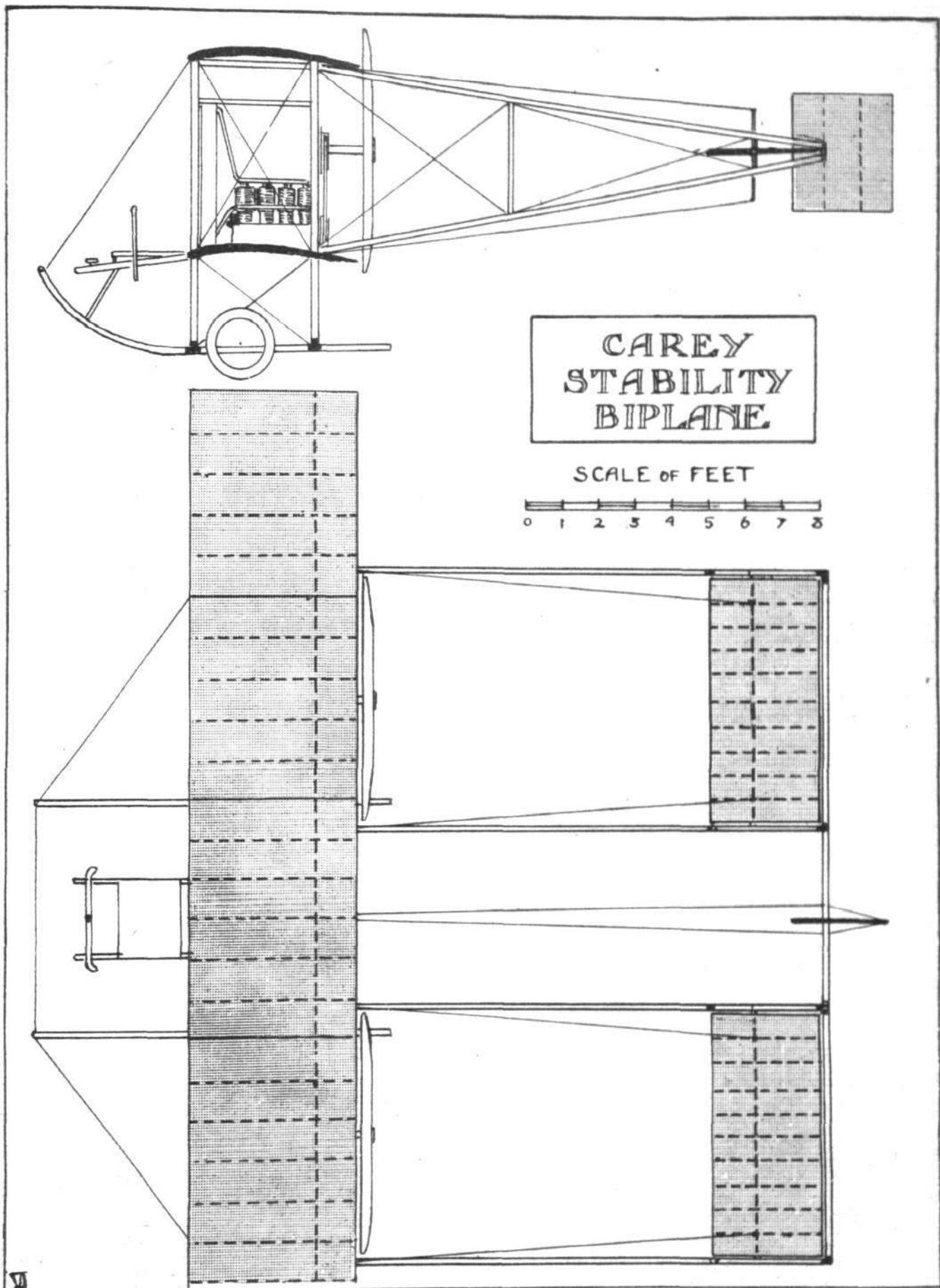
from the top view in Fig. 1, have a maximum gap in the centre and a minimum gap at the tips. In other words, both the top and the bottom planes are arched in the centre for about two-thirds the span, whilst the remaining portions at the tips are parallel and set at a dihedral angle. The top plane is set a little in advance of the lower one, and also has a slightly-increased angle of incidence. The planes are built up on more or less orthodox lines, upper and lower planes being separated by eight pairs of struts, and extending rearwards from the second rear struts; from the centre are four outriggers carrying the tail plane. The top and lower pairs each converge to a point where they are attached to a single vertical strut, which carries the tail plane.



The Steco hydro-aeroplane.

were ordered. The machine was then dismantled and taken to the Stevens hangar on Lake Michigan at Chicago, where it was re-assembled. The first test flights were made last July, under the pilotage of Ralph S. Stevens, with entirely satisfactory results, the machine flying well with two up. Trial flights are still being carried out, but the experiments are somewhat hampered by bad weather. This machine is a tractor biplane of the *nacelle* and outrigger type, and is, therefore, bearing in mind the date of design, one of the forerunners of the now popular tractor biplane. Natural stability, longitudinally and laterally, is obtained by virtue of the peculiar formation of the planes, which, it is stated, is an adaptation of the principles of the Zanon leaf that have also been embodied in the Dunne, Etrich, Handley Page, and other machines, only in the case of the Steco biplane they take a different form. The main planes are of rigid construction, and, as will be seen

This latter is, perhaps, the most interesting feature of the whole machine, for it is the only controllable surface employed in the steering of the machine in any direction. It is universally mounted on the aforesaid vertical strut in such a manner that it can be rocked in any direction longitudinally and laterally, and thus acts both as elevator and rudder, and incidentally as balancing plane. These combined movements are obtained by means of a single control lever, somewhat similar to a bicycle handle-bar, a forward or backward movement of which causes the machine to descend or ascend respectively, whilst turning it to the right or left steers the machine in those directions. In fact, tilting the control lever in any direction will cause a similar directional tilting of the plane, so that its movement in performing the functions of steering are such that it automatically compensates the banking of the machine when turning, thereby serving



The Carey stability biplane.

the same purpose of the movement of the vertical rudder covered by the Wright patent. Normally the tail plane is adjusted so that the machine will fly straight ahead when the engine is running, and will automatically assume its minimum gliding angle downwards when the engine is stopped.

Working automatically in conjunction with the tail plane are two vertical surfaces mounted one between each of the second pair of interplane struts from the wing tips. These two surfaces may be likened to check valves, for, co-operating with the formation of the planes at the outer ends, they maintain the correct banking angle when a turn is being made and prevent the machine from side-slipping outward for want of sufficient banking, and inwards through over-banking. They are hinged so that they can swing freely in an outward direction, but not inwards. When, therefore, the machine tends to side-slip outwards, the outer vertical surface acts as a brake to the movement in this direction, and assisted by the wing-form and relative dihedral angles, creates an additional lift on that side of the machine, which assumes its correct lateral angle for turning. The inner vertical surface is neutral because it is free to swing with the outward motion of the machine. A downward or inward side-slip is similarly checked.

As regards the rest of the machine, there is little at variance with usual practice. The 50 h.p. Gnome engine is fixed in the nose of a coracle-like *nacelle* mounted on the top and in the centre of the lower plane, passenger and pilot being seated in tandem. The two floats are set 11 ft. apart, and are connected to the lower plane by four struts each, with diagonal cross-struts to the centre. The principal dimensions of the Steco hydro-biplane are as follows:—Span, upper 41 ft. 8 ins., lower 36 ft.; chord, 6 ft. 2 ins.; supporting area, 464 sq. ft.; area of tail plane, 74 sq. ft.; overall length, 31 ft.; weight, empty, 1,320 lbs.; speed, 50 m.p.h.

Turning to the Carey biplane, shown in Fig. 2, it will

be seen that the general design is not so complicated. Briefly, the Carey stability and control system—which was worked out by Edwin R. Carey in April, 1910—consists of the employment of two surfaces situated side by side which besides functioning as elevators also serve as balancing planes or *ailerons*. As a matter of fact, much the same system is to be found on the Dunne and 1909 type Cody machines, although Mr. Carey knew nothing of either of these at the time he designed his biplane. It is rather interesting to note the similarity between the Carey and 1909 Cody machines. For reversing the direction of flight of the former we have the front divided elevator and balancing planes with vertical surface in between, twin screws, and main planes much in the same relative positions as on the Cody machine. On the latter, however, there was a vertical rudder at the rear, and in later models *ailerons* were fitted to the planes in addition to the front elevators. Where the Carey system differs from that of the Dunne is that the *ailerons* on the planes of the latter are used as elevators as well as for steering to the right or left, whereas in the Carey machine the elevators are used as *ailerons* and steering is effected by means of a vertical rudder—although there is no reason why the latter should not be dispensed with. These elevators are operated by two separate levers as in the Dunne machine, and can be operated independently or simultaneously. The rudder is actuated by a foot bar. The elevator planes are carried by four pairs of outriggers, two for each plane, extending from the rear spars of the main planes. At the trailing edge of the latter are the two propellers driven by chains from the engine, which is mounted on, and in the centre of, the lower plane.

It is stated that a machine of this pattern was constructed and flown in 1911, but a new machine is to be built shortly, and it will be flown by a former Farman and Blériot pilot. The principal dimensions of the machine illustrated are:—Span 28 ft.; chord 4 ft. 10 ins.; gap 5 ft.; supporting area 269 sq. ft.



THE BRITISH AIR SERVICES.

Royal Naval Air Service.

The following was announced by the Admiralty on the 10th inst. :—

Temporary Assistant Paymaster C. E. M. Hayford, to the "Pembroke III," for duty with the Royal Naval Air Service. Undated.

The following was announced by the Admiralty on the 11th inst. :—

Lieut. J. J. Warner, R.N., to the "Pembroke," for armament duties, Royal Naval Air Service. Undated.

The following were announced by the Admiralty on the 14th inst. :

Acting Flight Lieuts. L. C. Downing and D. C. S. Evill, and Acting Flight Sub-Lieut. S. Medlicott to the "Pembroke III," for course of training at the Central Flying School. To date Dec. 12th.

Royal Flying Corps (Military Wing).

The following appeared in a supplement to the *London Gazette* issued on the 10th inst. :—

Special Reserve. Supplementary to Regular Corps.—The undermentioned Second Lieutenants (on probation) are confirmed in their rank: J. R. Howett, E. L. M. L. Gower, E. K. Davies, M. B. Blake, G. C. Gold, C. H. Saunders, T. F. Rutledge, and R. M. Pike.

The following appeared in a supplement to the *London Gazette* issued on the 12th inst. :—

The undermentioned Second Lieutenants, *Special Reserve*, to be Flying Officers: Richard R. O. Paterson. Dated Oct. 3rd, 1914. Dated Oct. 30th, 1914: Edward K. Davies, Maurice B. Blake, John R. Howett, Cecil H. Saunders, Geoffrey C. Gold, and Edwin L. M. L. Gower. Dated Nov. 17th, 1914: Thomas F. Rutledge and Robert M. Pike.

The following appeared in a supplement to the *London Gazette* issued on the 14th inst. :—

The undermentioned temporary appointment is made at the War Office:

General Staff Officer, Third Grade.—Capt. Clive Mellor, Royal Engineers, vice Lieut. (temporary Capt.) H. R. P. Reynolds, Royal Engineers. Dated Dec. 3rd, 1914.

The undermentioned appointments are made:

Aeronautical Inspection Department.—Major John D. B. Fulton, C.B., Royal Artillery, Chief Inspector, to be graded as a Wing Commander, and to be temporary Lieutenant-Colonel. Dated Dec. 1st, 1914.

Central Flying School.—Capt. (temporary Major) Tom I. Webb-Bowen, the Bedfordshire Regiment, Assistant Commandant, to be graded as a Wing Commander, and to be temporary Lieutenant-Colonel. Dated Dec. 1st, 1914.

Special Reserve. Supplementary to Regular Corps.—Second Lieut. (on probation) James Valentine is confirmed in his rank.

The following appeared in the *London Gazette* issued on the 15th inst. :—

Lieut. (temporary Capt.) Herbert R. P. Reynolds, Royal Engineers, from a General Staff Officer, third grade, at the War Office, to be a Flight Commander, and to retain his temporary rank. Dated Dec. 3rd, 1914.

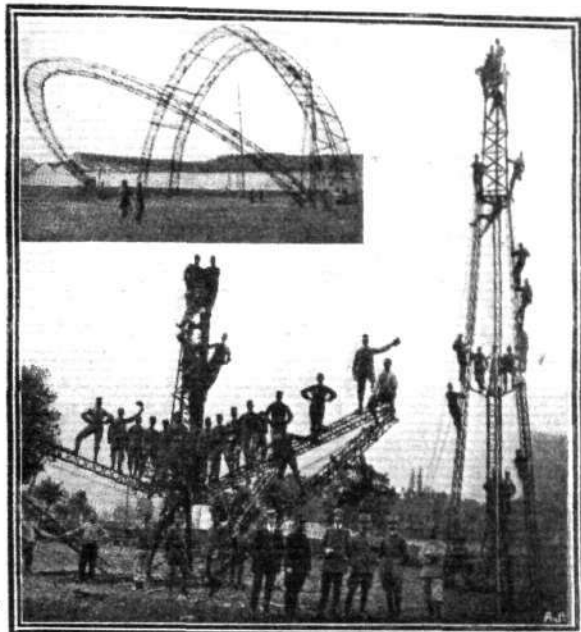
Lieut. William H. C. Mansfield, the King's (Shropshire Light Infantry), from a Flying Officer to be a Flight Commander, and to be temporary Captain. Dated Dec. 7th, 1914.

Second Lieut. James Valentine, *Special Reserve*, to be a Flying Officer. Dated Aug. 30th, 1914.

Special Reserve. Supplementary to Regular Corps.—Second Lieut. (on probation) Robert Loraine is confirmed in his rank.

PORTABLE AIRSHIP SHEDS.

THE use of airships is to a large extent limited by the necessity for providing shelters at convenient places, so that, should the weather or other circumstances necessitate it, there will be no necessity for the airship to remain in the open. Several suggestions with regard to projects for the building of temporary sheds have been put forward from time to time, and in the following are given some details of a design which has been evolved in Italy. Our



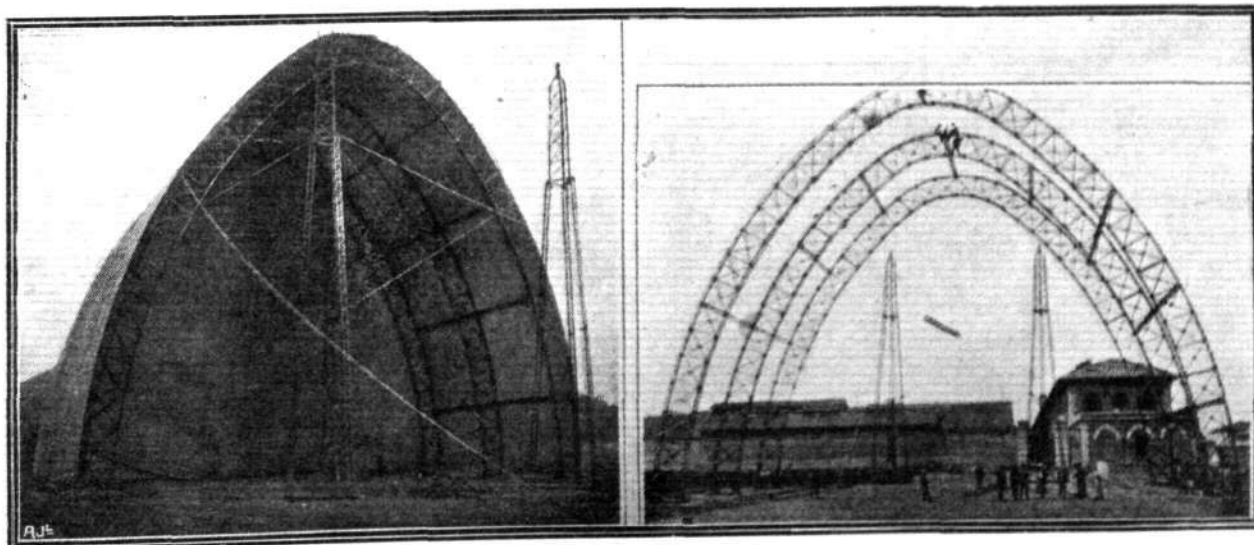
DIRIGIBLE AIR-SHED CONSTRUCTION.—Arches in the course of erection. The pillars are built up of hinged sections.

illustrations and description, for which we are indebted to our esteemed contemporary *Scientific American*, show the Bosco and Donadelli system of portable hangars, which has been tried for field work by the Italian aeronautical corps.

"The different sections which make up the arches are locked together by using a hinge clamp which is peculiar to the present system. Tooth projections on one

piece fit into recesses on the opposite piece like the two halves of a hinge, so that when placed together, all that is needed is to run a pin through the matched holes in order to couple the two pieces. Each arch is made up of a certain number of sections which are thus joined together, and there are two separate hinge joints used at the meeting point. After locking one joint as we have seen, this forms a hinge so as to bring the other joint in place, and it is then ready to be locked as before by means of a pin, so that the two sections are tightly fixed together by means of the two joints. To dismount the sections, the only operation needed is to withdraw the two locking pins so that the joints readily come apart. In this way the arch is built up while it is lying on the ground, and is then ready to be mounted in an upright position. At the proper points on the ground the base plates are laid which form the foot of the arch. Each plate carries projecting lugs in the shape of a half-hinge. These are made to match with a like part on the arch end so as to make the joint. After running a pin through the hinge while the arch is lying on the ground, the last is raised to the upright position by using ropes and pulleys, and when in place, the second joint between base-plate and arch now matches, and this is fixed by driving in a pin, so that the arch is now fixed to the base-plate very strongly. The second arch is now raised in the same way, and the two are bound together by cross brace pieces of structural iron work, as will be noticed, and so on until the right number of arches is erected.

"Another point in the assembling of the hangar needs to be considered, this being the erecting of the structural iron poles or towers which are required in order to draw up the arches by means of cables. It has been a problem to set up such towers in the proper way in field work, as they must have a considerable height in order to serve for handling the arches and at the same time must be very strong in view of the great weight of the arch. The Italian constructors make use of the hinge joint principle in a very good way for mounting the towers. In the first place, a short structural iron pole is fixed on the ground upon the base plate so as to form the lower and centre part of the tower. It carries a set of pulleys at the top



DIRIGIBLE AIR-SHED CONSTRUCTION.—On the left showing three sections in place covered with the metallized cloth which is used. Each arch is built up in sections on the ground, and is then raised into position and bolted together as seen in the photograph on the right.

for use in raising the rest of the tower in place. The base plate is triangular, and at each end of the triangle a beam of the tower is fixed by means of a hinge joint. This beam is in reality double, having a hinge placed at the middle upon its height, but both sections of the beam can lie on the ground owing to the hinges. All three beams come together at the outer or top ends and are hinged to a single top pole or cap. The whole can be assembled with the sections lying on the ground with the exception of the top cap, which fits down over the middle post. When the hinge joints are assembled, the whole is drawn to an upright position by ropes and pulleys, and in this position the second joints between the various pieces all come together so as to be locked in place by pins, thus making a three-sided tower with its cap piece, and the whole construction is very solid.

"On dismounting the tower, the men climb to the top and draw out one of the hinge pins at each locking point,

leaving one joint which acts as a hinge as before. The tower is then lowered, as a whole, in the same way as it was raised. All these operations can be carried out in a short time. When the first two arches have been raised and bound together, the tower is no longer essential, for the arch structure can now take its place so as to carry the ropes for raising the other arches of the hangar.

"A new fabric is used for the covering material, comprising a metallised cloth which has great strength and is also weather-proof. It hangs down at each end of the hangar as a double curtain which can be drawn apart at the sides. The dimensions of the new military hangar of the present standard type are 270 feet length by 100 width and 80 height. A very good speed in mounting is assured, and all can be put together within two days. When transportation by railroad is necessary, the folded metal work, with the covering and all needed parts, can be carried on a train of twenty cars."

FROM THE BRITISH FLYING GROUNDS.

Eastbourne Aerodrome.

PUPILS with Instructor on E.A.C. biplanes last week: Flight Sub-Lieuts. Barnes, Pullin, Travers, Teesdale, Openshaw, Wood, Sibley, Gerrard, Brisley, and Bailey. Instructors during week: F. B. Fowler and R. C. Hardstaff.

London Aerodrome, Collindale Avenue, Hendon.

Grahame-White School.—Sunday last week, Probationary Flight Sub-Lieuts. Breese and Livock solo straights; Walmesley (new pupil), instructive passenger flight and straights with instructors; Probationary Flight Sub-Lieuts. Price, Wakeley and Watson solo circuits, eights, &c.; Dalison and Mills straights with Instructors Manton, Shepherd and Russell.

December 7th and 8th, no pupils out owing to high winds.

On Wednesday, Probationary Flight Sub-Lieuts. Price and Young solo circuits, &c., Sub-Lieut. Price afterwards gaining his certificate in very good style. Probationary Flight Sub-Lieut. Breese solo straights and circuits.



Mr. Donald C. MacLachlan, who obtained his certificate at the Beatty flying school at Hendon last month. (Photo. by F. N. Birkett, Shepherd's Bush, from the "F.N.B." series of aviators).

Thursday, Probationary Flight Sub-Lieuts. Barnes solo straights, Ffield and Young circuits, eights, &c., and Probationary Flight Sub-Lieut. Ffield going in for and gaining his certificate.

Saturday, Probationary Flight Sub-Lieuts. Barnes, Breese, Ffield, Watson, Wakeley and Young solo circuits, eights, &c. Probationary Flight Sub-Lieut. Livock and Mr. Greenwood solo straights and half circuits. Probationary Flight Sub-Lieuts. Dalison, Mills and Walmesley straights with Instructors Manton, Russell and Shepherd.

Beatty School.—Monday and Tuesday of last week the weather very bad, so no school work possible.

Pupils receiving instruction during the week with Mr. E. Baumann and W. Roche-Kelly on "dual"-controlled 50 h.p. Gnome biplane and 40 h.p. Wright biplane:—Messrs. Virgillio (25), Gardner (17), Leeston-Smith (24), Anstey Chave (22), Cornish (30), Merton (10), Donald (20), Roche (10), de Meza (10), G. Perrot (8) and Lieut. Bannertyne (8).

Mr. Geo. W. Beatty was prevented from giving tuition during the week, as his new machine is not quite finished, owing to the 60-70 h.p. engine having been delayed on the railway. This should come to hand any moment now, and should prove a great acquisition to the school, as the bad weather we are experiencing calls for large h.p. training machines.

Hall School.—Monday and Tuesday, last week, gale and rain.

Wednesday, Lloyd Williams four good straights. E. W. Connochie six in usual good style. Thursday, gale and rain.

Friday, Messrs. J. L. Hall and J. Rose out testing tractor biplanes Nos. 2 and 3, later E. W. Connochie 6 straights, and Lloyd Williams three straights and one straight flight.

Saturday, quite a good day. Archie Davy six straights, improving. Arthur Waterson four straights, showing good aptitude. Lloyd Williams six straight flights, and E. W. Connochie four.

Instructor of the week: J. Rose. Machines, Hall tractors.

London and Provincial Aviation Co.—Straights or rolling alone, Messrs. Abel, England, Derwin, Moore and Laidler.

Circuits and figure eights, Mr. Barfield, and on Saturday Mr. Barfield took his certificate. Instructors Warren and Smiles.

BOMB-DROPPING FROM AEROPLANES.

It would appear, at first sight, to be somewhat remarkable that attempts to drop bombs from aeroplanes in flight upon a stationary target should prove so difficult of accomplishment even when the object aimed at presents an exceptionally large surface when viewed from the air. But bearing in mind experiences in that direction during early youth, from a window at a comparatively small height, the frequency with which "misses" occur becomes less surprising; and that a "hit" is registered within the desired area at all, is sufficient commentary on the skill of those engaged in the operation. If, for example, a pilot is in possession of a bomb sighting apparatus that is capable of making the exact allowances which are required to compensate for all the factors that affect the accuracy of aim, so that if a bomb were discharged at the correct instant it would be sure of hitting the mark, a delay of one second in releasing the bomb would cause the projectile to overshoot the mark by 88 ft. and 146 ft. at flight speeds of 60 and 100 miles per hour respectively, since the trajectory would be displaced by these distances.

Now the two most important factors entering into bomb-dropping calculations are—(1) the speed of the machine, (a) relative to the ground and (b) relative to the air; and (2) the height from which the bomb is dropped. The speed of the aeroplane relative to the ground determines the initial horizontal velocity of the bomb, and hence the amount of energy stored up in it; so that the forward motion of the bomb in a horizontal plane and the distance ahead of the objective at which the bomb is released will be partly governed by this factor and will become greater as the ground speed is increased. The air speed of the machine is important because the difference between the speed relative to the ground and the component of the air velocity in the line of flight, combined with the shape of the bomb, will determine the air resistance encountered by it in the direction of flight; and, therefore, the retardation or acceleration of its motion in that direction will depend upon that resistance, as well as upon its initial flight speed, in a horizontal direction, relative to the ground. The downward displacement of the bomb will be governed by its velocity in that direction, which it changes from instant to instant under the acceleration due to gravity, thus increasing as the square root of the height through which the bomb has fallen. The air resistance, which varies approximately as the square of the velocity, will, however, operate as a retarding force, and tend to diminish the speed of falling, thus causing a longer time to elapse before the bomb reaches the ground and permitting the horizontal forward displacement to be increased. In addition, the effect of a side wind upon a projectile must be considered. The wind may blow from any point of the compass and may vary both in magnitude and direction at different altitudes; but in whatever direction it may come from the tendency will be to cause the falling bomb to deviate from the plane in which it was originally released unless the wind is also in that plane. The amount of the deflection will depend in part upon the shape, size and weight of the bomb, upon the velocity and direction of the wind and upon the height through which the projectile falls before striking the ground.

Of the foregoing factors, the air speed and the altitude of the machine can be gauged to a high degree of accuracy with the assistance of the instruments with which such an aeroplane is fitted—the air-speed indicator and the aneroid; while a fairly approximate estimate of the

ground speed can be made by an experienced pilot, although the difficulty of so doing will increase with altitude. Hence, the unknown quantities are principally due to the undetermined resistance offered by the air to the passage of the bomb, and the effect of the wind upon its direction of motion, together with the difficulty of ascertaining what allowances must be made for speed and height—only the latter of which may, however, be overcome by the use of a bomb-sighting device.

There are, however, several other but minor influences which tend to diminish the accuracy of aim in bomb-dropping, of which three may here be mentioned. Firstly, the motion of the bomb, if of other than spherical form, at the instant of its release is not generally along its regular path of descent; but an appreciable time, comparatively speaking, elapses before its axis lies tangential to the line

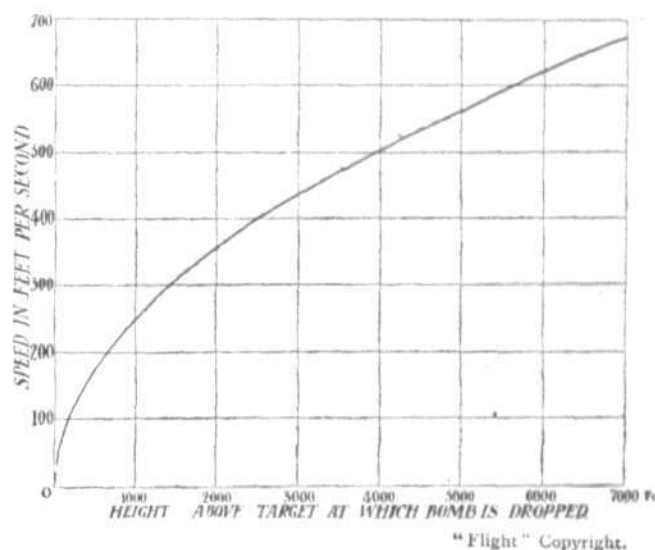
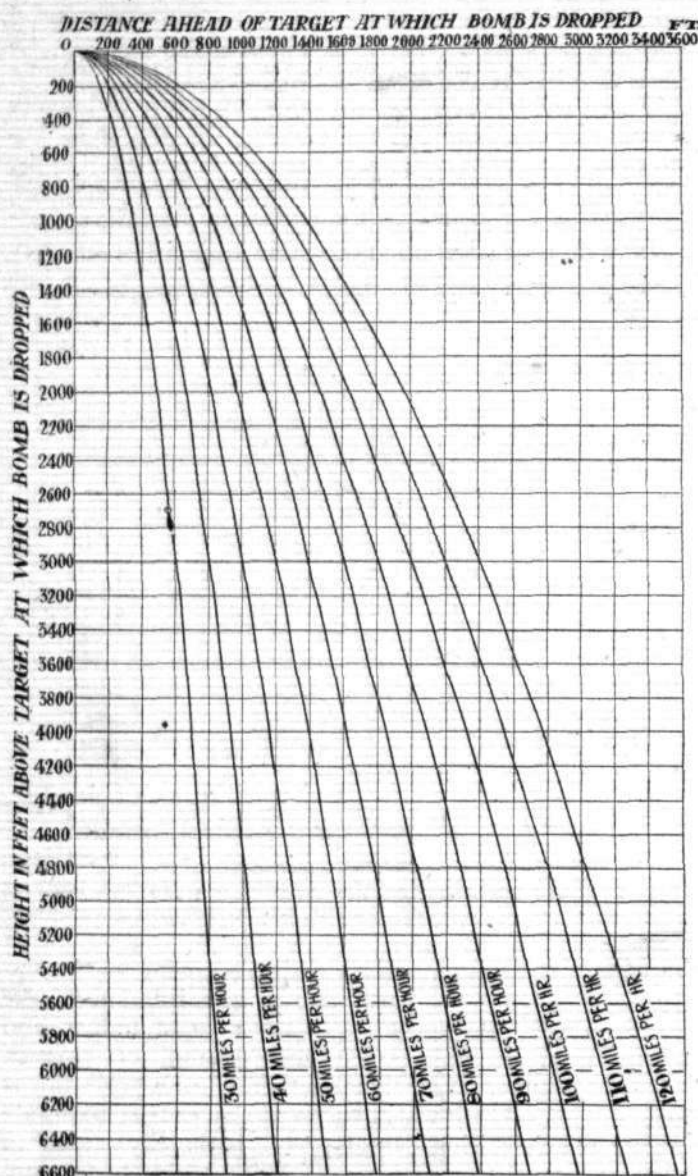


Fig. 1.—Diagram showing the velocity of a falling body at different heights during descent, neglecting air resistance.

of flight. Secondly, there is a displacement of the trajectory relative to the earth due to the rotation of the earth, which movement is, in the case of bullets and shells fired at objects on the ground, of appreciable magnitude. Thirdly, the "drift" of a projectile is of some importance where the bomb is caused to rotate about its axis during descent, as it is thereby caused to deviate from the normal line of flight owing to the tangential action of the air. Sir George Greenhill is quoted by Besant in his text-book on "Dynamics" as stating that the deflection observed in the case of a shot fired at long range was 1,000 yards, the greater portion of which was due to "drift." In the matter under discussion, however, these three factors will assume only a minor importance, partly because comparatively they are small, and partly because, owing to the direction of motion of the bomb, the deviation is not so great as the figures above quoted would lead one to suppose.

In the first place, it will be convenient to neglect the resistance of the air, and to assume that the bomb falls freely acted upon only by the force of gravity and by the initial impulse given to it. Under such circumstances, the forward motion will be determined by its initial velocity; and its vertical descent by its acceleration due to gravity. If no resistance is offered in either direction, the forward velocity will be that of the machine at the instant of release; while the speed at any time during

descent will be found from either of the equations— $v^2 = 2gh$ or $v = gt$; where v is in feet per second, g is the acceleration due to gravity, h is the height through which the bomb has fallen and t is the time in seconds which has elapsed since it was dropped. The velocity attained on striking the ground when dropped from various heights up to 7,000 ft. is shown in Fig. 1, where



"Flight" Copyright.

Fig 2.—The trajectories of a falling body discharged from an aeroplane travelling at speeds of from 30 to 120 miles per hour—neglecting air resistance.

it will be seen that an object falling freely from a height of 6,000 ft. will strike the ground at a velocity of 620 ft. per second or over 420 miles per hour!

But as it is the trajectories described by falling bodies which are being determined, it is convenient to use the well-known expression—distance passed over from rest $= \frac{1}{2}gt^2$ for the vertical displacement, the acceleration g being taken as equal to 32.16 feet per second². For the forward motion, since the speed in that direction is constant, the distance moved is equal to vt . Plotting the distance dropped as ordinates, with the forward displacement as abscissæ, the curves shown in Fig. 2 for "ground" speeds of from 30 to 120 miles per hour are obtained.

Clearly since the curves show the line of flight of an object dropped from a moving platform and falling under the influence of gravity, it would only be necessary if air resistance were negligible to know the earth speed of the aeroplane, the elevation at which it is flying, and its horizontal distance from the objective in order to secure a hit every time. If the machine is travelling at a speed of 60 miles per hour at a height of 4,000 ft., the bomb should be dropped at a distance of 1,408 ft. before reaching the object! Whilst it would be an easy matter to devise an instrument that would consist of a special wide angle telescope fitted with cross wires in its interior, pivoted at the upper left hand corner of the diagram, and working over a plate upon which Fig. 2 is engraved, a transparent index could be attached to the telescope, upon which a line has been drawn parallel to the axis of the latter and passing radially through the point about which it pivots. Then in order to "sight" an object, the index would be moved until the line upon it intersected the curve of aeroplane speed at the point where the abscissæ of elevation crossed the latter; and when the objective is seen passing the intersection of the cross wires, the bomb would be dropped.

The question of air resistance is not, however, a negligible matter; and, therefore, such an instrument could not be used otherwise than as a general guide to the operator where it was necessary to fly at a high elevation, although it is conceivable that by providing suitable adjustments on the cross-wires, or the framing to which they are attached, the important effects could be accounted for. In any event, it might be of some utility where the direction of the wind was along the fore-and-aft direction of the machine.

Some conclusions may, however, be drawn from an inspection of Fig. 2. The diagram shows (1) that as the "earth" speed of the aeroplane decreases, the trajectory exhibits a tendency to assume a more and more vertical position, which tendency is increased as the height becomes greater, owing to the high velocity of the projectile as it nears the ground. Hence, it would appear desirable on these grounds to fly as high and as slow as possible in order to attain accuracy of hitting, as there is less liability to error in estimating distances. At a height of 6,000 ft. and at 30 miles per hour, for example, a variation in elevation of 1,000 ft. will cause a lateral displacement of the trajectory of less than 100 ft.; whereas at 1,000 ft. and at 120 miles per hour the displacement will amount to approximately 700 ft.

Secondly, when gliding to a low elevation from a height, with the aeroplane under power, the tangent to the trajectory and the axis of the machine will gradually become parallel, and therefore the accuracy of aiming would tend to increase when flying low and at high speed. The bomb should, therefore, be released at the end of a dive to a height of, say, 500 ft. and when the axis of the aeroplane, which would approximate to its direction of motion, is pointing at the desired objective.

These, therefore, are two conditions under which great accuracy may be readily obtained. Both are at a disadvantage in some respects, the former because of the marked deflection produced by winds on the trajectory described and the difficulty of judging distances; and the latter, because of the danger of attack from the ground, which, however, the high speed would somewhat reduce. It is probably because of the better aim acquired by the latter method that this particular manœuvre has been resorted to in dropping bombs.

EDDIES.

FROM the ever-cheerful and optimistic Louis Noel we have received the post-card, seen in the accompanying illustration, with the greeting: "I send to you and to the whole staff of FLIGHT my best wishes for a Happy Christmas and Bright New Year in the hope that soon we shall meet again at Hendon." From the fact that Noel is himself, in the picture, seated in a Morane monoplane, it must not be concluded that he is flying this type of machine. Noel is, as I have pointed out before, attached to an Escadrille Blériot, among whose members is also found Capitaine Oswald Watt, the Australian aviator. The wish expressed by Noel that we may all soon meet again at Hendon, is one which will be heartily reciprocated by one and all.

I was greatly interested in a "trial run" of a new Imp cinematograph drama produced for the Trans-Atlantic Film Co. Ltd., entitled, "The Secret of the Air." It will be "released" on January 21st, 1915, and should appeal to a number of FLIGHT readers, since it shows, incidentally to the "story," several scenes from Hendon at its best in bright sunlight as we all like to remember it. It would not be fair to reveal the plot, but it is sufficient to state that the airman's part is played by Claude Grahame-White, who, in those days, before the war claimed his services in a more serious capacity, revealed himself as an amateur film actor of no mean order. Among the other scenes witnessed on this film, and only indirectly connected with the "story," is a very exciting start by the late Gustav Hamel on his 50 h.p. Blériot in a nasty side wind, and an equally fine landing showing Hamel in his best form. As a reminiscence of Hendon's great days, "The Secret of the Air" is well worth seeing, apart from the interest attached to the "plot."

Visitors to Hendon Aerodrome on Saturday last were treated to an enormous amount of air work, which, as regards quantity, was quite equal to anything seen there in the days of exhibition flights and races, although

naturally of a non competitive character, since it consisted almost entirely of school work. The lack of excitement, however, must have been mostly on the part of the spectators, for, as regards the pupils themselves, I should imagine that they were having all the thrills that they wanted, what with handling their own machines, and dodging other 'buses piloted by other enthusiasts in various stages of proficiency. Whether it is a matter of luck or due to the pupils' skill is difficult to determine, but it certainly seems nothing short of marvellous, that no collisions have yet taken place, in view of the great number of machines that may be seen in the air on any calm day. Although the aerodrome is of ample size, the portion of it that is fit for rolling and "straights" in the earlier stages of a pupil's career is comparatively small, and it is not difficult to understand why the Naval authorities require practically all the space available. Even when the private schools have vacated their sheds there will not be too much moving room, either of the ground or air variety, for almost every day sees the arrival of new machines from various factories. The types now represented out at Hendon include: School machines belonging to the gender colloquially known as the "box kite," Henry and Maurice Farmans, Caudrons, Avros, B.E.s, Sopwiths (Tractors and "Pushers"), Handley-Pages, Deps., Grahame-Whites, Martinsydes (Scouts), &c., and as the number of pupils increases, the demand for more and more machines grows correspondingly.

Several of the hangars that have been vacated by private firms have already been occupied by the Naval authorities, and at the other schools which are due to leave the aerodrome preparations are being made to pack the various machines for transport to "pastures new." Two of these schools have already succeeded in finding suitable sites, where the work of erecting the necessary accommodation will be commenced at the earliest possible



A seasonable card from Louis Noel to hand this week, whose greetings we sincerely reciprocate, both on behalf of ourselves and, we feel sure, of our readers, who have followed in our pages all the good work which he has done here, and is now adding to on the side of the Allies.

opportunity. Although the exact locations of these two new schools cannot be disclosed at present, both are within easy access from London, and will, as soon as a few trees and hedges have been cleared away, be in shape for school work.

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The latest addition to the Grahame-White "stable" is a 'bus designed to accommodate sixteen passengers, thus far exceeding the capacity of the old five-seater, which, it will be remembered, only managed to carry ten. The cabin of the latest "baby," designed on exceedingly generous lines, is totally enclosed, and fitted with windows on all sides. It is intended to provide heating for the cabin by means of an ordinary stove, as the 'bus is primarily designed for use in the winter, when a warm, cosy cabin is a luxury not to be despised. The view obtained through the windows in the sides of the 'bus is practically unobstructed, and for those of the passengers who wish a still better view and do not object to the wind there is a platform on the roof of the cabin, reached by

a spiral staircase. At the moment of writing it has not been definitely decided what make of engine will be fitted, but it will in all probability be one of the stationary type. As all the hangars are pretty full up, the 16-seater is at present taking its chance out in the open, and is used as a shelter by pupils in the early morning hours while awaiting their turn on one of the ordinary school 'buses. In case a copy of this Journal should find its way over to Germany *via* some circuitous route and there excite the envy of the military authorities to such an extent that they should decide to send one of their aviators over to Hendon with the object of destroying the new 16-seater by dropping bombs indiscriminately all over the aerodrome, I hasten to point out that it will hardly be worth their while, as the 'bus in question is one of the old "Generals" minus its wheels, which had for some time past been left in a forgotten corner behind the sheds, until, quite recently, it was brought to the front, as it were, where it is in great demand as indicated above.

"ÆOLUS."

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AIRCRAFT AND THE WAR.

In the *Messenger de l'Armée*, the official paper for the Russian army, it was stated that on the 8th inst. two German aeroplanes were destroyed in the Lodz district, one by rifle and the other by artillery fire.

It was reported from Petrograd on the 9th instant that the Russian troops in Poland have recently been successful in bringing down one German aeroplane nearly every day. On the 8th inst., two aeroplanes were captured in the Lodz district. Around Przemyśl and Cracow the Russian advanced forces had 12-in. bombs dropped on them by the Austrians, but these missiles did little damage. A Russian aviator was reported to have dropped bombs on Breslau.

In the *Temps* of December 9th there was published a translation of some instructions issued by the German General Staff to artillery officers, warning them to economise ammunition as far as possible. Among the instructions was one emphasising the importance of a direct observation. When this cannot be done, officers are recommended to make use of aeroplanes, captive balloons and flank observers.

The following was reported by Reuter's correspondent at Cetinje on December 9th:—

"An Austrian aeroplane yesterday flew along the front of the Montenegrin army operating on the frontier of Bosnia and Herzegovina, and threw down leaflets boasting of Austrian successes over the Serbians and depicting the situation of the Allies as desperate. The leaflets also contained the announcement that the British fleet had everywhere been beaten by the Germans, and that London was being bombarded daily by Zeppelins.

"The same aeroplane threw two bombs on Nikshitch and two on Cetinje, without, however, doing any damage.

"Two Austrian hydro-aeroplanes flew over Antivari last night, and threw several bombs intended to destroy a French transport, but the attempt failed."

In a despatch to the *Daily Chronicle* from Northern France on December 9th, Mr. L. A. Jones wrote:—

"A German convoy and a detachment of cavalry have suffered considerable damage at the hands of the twenty-year-old Belgian who only six weeks ago volunteered for flying work. The hero has been promoted to the rank of lieutenant, and will probably be decorated. After setting off in the direction of Ostend on the first occasion, he subsequently turned south on catching sight of a German column in action. With the recklessness of inexperience and youth he flew very low over the enemy's lines, so low that it was not until he dropped his first bomb that the Germans grasped the fact that this was not one of their own aeroplanes. Before they could turn their guns on him the mischief was done. Three motor lorries

were destroyed, and the whole transport column, which was hurrying to the front, was thrown into confusion. Having made his escape by rising to about 5,000 ft., the aviator flew in the direction of Bruges. South of the town he observed a detachment of cavalry taking cover behind a cluster of farmhouses. The first bomb went wide, but the second fell into the midst of the squadron. The airman was not able to observe accurately the amount of the damage he had done, for the Germans got to work with the anti-aeroplane gun, and an unlucky shot severed his control wires. He thought he would just manage to volplane into safety. As a matter of fact, he landed in the flooded area of Ramskapelle, directly in the line of fire from both sides. However, he was able to wade ashore and get to his own lines, and even the aeroplane was ultimately brought in."

Regarding the aerial bombardment of Hazebrouck on the 6th inst., a *Daily Chronicle* correspondent wrote on the 9th inst.:—

"Eleven men of the East Lancashire Regiment were killed and seven wounded by bombs dropped from a German aeroplane at Hazebrouck. Five bombs were thrown down by the aviator, and the total number of casualties was 33 killed and wounded. Although the aviator was flying at a height of 6,000 ft. two British airmen rose rapidly and pursued him. He flew towards Ypres, where he was attacked by aerial guns and was met by quite a convoy of British aeroplanes which had been apprised of his approach by telephone from Hazebrouck. The German machine came down into the British lines, and when examined the bodies of the German officer and his pilot were discovered to be riddled with bullets."

In a letter to his father, an officer of the Guards wrote:—

"We are in the best of spirits, and very cheery. We were awakened on Sunday morning by a huge explosion, and we found it was a German, flying in a French aeroplane. He dropped six bombs on the town a kilometre from this village. One did not explode, but buried itself in a field 500 yards from anywhere. It is a big yellow thing, the size of a football. Another killed nine men and severely wounded nine, and wounded several others, making a total of about thirty casualties. One went through a house, and one burst in a back garden, causing much damage to windows and roofs of adjoining houses, and the other two fell on a road, making a hole about 6 ft. in diameter, and about 4 ft. deep. He was evidently trying to hit the railway station, but made bad shots. So we have seen some of the dangers of the air."

Writing with reference to the strength of the German position in the neighbourhood of Rheims, a *Morning Post* correspondent on December 10th said:—

"Hence the long unending artillery duel which forms the monotonous 'chorus' of the daily *communiqué*, for naturally the guns can reach the fortified positions. Exactly what impression they make must remain more or less problematical, but if it be permitted to judge from the effect of the German response—after all a

fair enough guide, since the enemy is kept informed by quite as efficient a service of air scouts as ourselves—the net result, in so far as shaking the strength of the military positions is concerned, is not very great after all.”

In a French official *communiqué* issued on the 10th inst. it was stated:—

“Yesterday our airmen again threw bombs successfully on the station and aviation sheds at Freiburg-im-Breisgau (south of the Black Forest). Sixteen bombs were dropped. In spite of a lively cannonade the airmen returned safely.”

In the German *communiqué* there was the following reference to this incident:—

“Yesterday three of the enemy’s aviators dropped about ten bombs on the open town of Freiburg, Baden. No damage was done. The incident is merely mentioned here in order to show that once again an open town not situated within the range of the operations has been attacked with bombs by the enemy.”

According to information received from Amsterdam, three of the Allied aviators were seen at 3.30 p.m. coming from the western side, and they went in the direction of Zähringen. During their flight heavy gun and rifle fire was directed upon them, compelling the airmen to disappear.

On the other hand, a *Daily Mail* correspondent at Copenhagen reported:—

“I learn from Berlin that the last aerial raid made by French airmen with the object of destroying the airship sheds at Freiburg-im-Breisgau resulted in great damage to the sheds. The German official reports admit that the French airmen got away safely after dropping ten bombs, which they say only caused slight damage. I learn that a number of employees were killed.”

In the account of the French official “Eye-witness,” published in Paris on December 10th, there was the following:—

“There is a story to the credit of the aeronaut section of our forces, though the story is an old one. It took place in the plain to the west of Hesten. An aeronauts’ corps under Capt. Saconay were unrolling an iron cable to which were fixed some kites for supporting the balloon car. Observer Tourtay took his place in the car, and the cable was paid out. He reported German batteries of 105 mm. guns to the west of Bixschote, and another battery south of Herken. The news was transmitted to the artillery, which then did good work. A subordinate officer reported that he could see a black spot far away in the sky above the enemy’s lines. The captain said he could see an aeroplane advancing. ‘He is a bosche; to your rifles!’ The observer, however, continued watching up in his balloon with perfect composure. In a twinkling men took up positions, and seven or eight salvoes caused the aeroplane to disappear. ‘It is our music he cannot face,’ said the soldiers.”

Writing from Nancy on December 10th, a special correspondent of *The Times* said:—

“Apart from the impassive conflict of the trenches, spies and aeroplanes have provided the main incidents. On December 4th a German warplane flew over Commercy and dropped four bombs near the station. Three of them fell on the line without doing much damage, the other plumped into the Meuse. On the 5th a Taube made its appearance over Bar-le-Duc, coming from the north-east. At first it was flying impudently low, but a volley from the garrison soon sent it to a more respectful height, and it moved off quickly in the direction of Verdun. At Chaumont-sur-Aire, a few miles short of the fortress, it was brought down by a shell from a 75. The machine was entirely destroyed by the fire caused by the explosion of the petrol tank, and all that was left of it and its pilot and observers were the charred remains of three aviators’ helmets. The growing frequency of these aeroplane flights on the part of the Germans in the district probably means that their spy system has more or less broken down, and that they are obliged to depend on their flying corps for information which, up to the present, they have been able to get by signals or even by word of mouth. It is also possible that they have got wind of the visit to the district of M. Poincaré, who two days before went to Sampigny to see what the Germans had done to his native town. The President of the Republic would have been a tempting mark for a bomb.”

“Meanwhile the French are constantly carrying out reconnaissances on their own account. An officer of the Verdun Flying Corps who lately paid a visit to Montmédy, 25 miles due north, reports

that the village has suffered very little from the German occupation, and that there are few traces of damage to be seen.

“All through the reported investment the spirits of the garrison and the 3,000 civil inhabitants of the original population of 15,000 or 16,000 have been excellent, in spite of occasional visits from aeroplanes and the accompanying bombs, which are all that Verdun has seen of actual warfare.”

A correspondent of the *Nieuws van den Dag* at Sittard, in the Province of Limburg, on the 10th inst. reported that two aeroplanes coming from a southerly direction flew over Sittard at 6.30, and then proceeded eastwards to Germany, in the direction of Düsseldorf. Searchlights were working at short intervals.

A *Daily Mail* correspondent reported from Rome on the 10th inst.:—

“An Austrian airman flying over Cetinje dropped two bombs at a hospital above which the Red Cross flew. The bombs fell by the side of the building and injured a little boy who was returning from school. Despite rifle fire the pilot escaped.”

It was reported from Amsterdam that on the 10th inst. a Zeppelin was seen over Turnhout, proceeding in the direction of Antwerp. According to advices from Ghent on Monday, a Zeppelin, which was going from Nieuport in the direction of Dunkirk, was obliged to return, owing to the heavy fire of the Allied artillery.

Writing from Geneva on December 10th, on the subject of Zeppelins, a *Daily Express* correspondent said:—

“At Friedrichshafen, Meersburg, and Lindau, the working people, many of whose menfolk are employed in the airship factory in the first-named town, are asking when Count Zeppelin will keep his promise to the Kaiser. The count promised the Kaiser to make an aerial raid on England, and especially on London, ‘before the end of the year.’ He made, however, two conditions, first that he should be given a good base near the North Sea, and second, that he should be supplied with enough money and materials to build a fleet of at least ten new and exceptionally-powerful Zeppelins, which can remain in the air for at least thirty hours. The Emperor agreed, and the funds were voted for ‘special service.’

“Count Zeppelin has at present seven aerial Dreadnoughts at his disposal at Friedrichshafen, Düsseldorf, Berlin, and Hamburg. The eighth was seriously damaged by Commander Briggs in his recent raid, in spite of German ‘news’ to the contrary, and is being patched up to join the second line of Zeppelins, which number about a dozen, and which are useless for long journeys. Since the English aviators’ raid, work on a new Zeppelin, which now takes nineteen to twenty days to complete, as all the principal parts are made in other German factories, has been started at Friedrichshafen, where the number of workmen has been recently increased by 250. The sleepy town has become a fortified camp, with Maxim guns in the streets and on the neighbouring heights.”

A correspondent of the *Daily Mail*, writing under date of December 10th, said:—

“Yesterday (December 9th), the Germans saw from a captive balloon that considerable French troops were again arriving in Alsace. The balloon was exposed to a continual fire from French guns, but the balloon was moved all day long in the Hirzbach Wood by motor cars.”

According to Moscow newspapers, during the ten days’ battle near Novo Radomsk German aeroplanes constantly flew over the town and threw bombs in the most crowded thoroughfares, their principal targets being bazaars. The same thing happened at Piotrkow, where the hostile aeroplanes attacked hospital trains.

A message from Petrograd on the 11th instant stated that a German aeroplane was brought down near Stary Sandec, Galicia, and the two occupants, both of them officers, were made prisoners. Another German aeroplane was reported to have been brought down and captured at Plock.

The *Morning Post* correspondent at Petrograd, in a message dated December 11th, said:—

“The Germans are now utilising cavalry for this purpose (reconnaissance) with considerably more freedom than hitherto noticed,

but their aeroplane work has been curtailed owing to the Russians having now learnt the art of bringing down these dangerous eyes of modern armies when flying at any altitudes that are useful for the purposes of spying.

"Both the Russian artillery and picked shots with rifles are now able to cope with aeroplanes with tolerable certainty. Rarely a day passes but one of these man-birds is knocked over, and occasionally the bag reaches two or more. I believe the Russian success with artillery against aeroplanes is due to a novel application of old forms of missiles long discarded in ordinary warfare. During the early period of the war the artillery fired shrapnel at aeroplanes, but with comparatively little success. An aviator who has been bombarded by German batteries told me that shells bursting about the machine, however unpleasant, never crippled him, and the worst sensation was when a shell burst underneath, creating a hole in the air down which the machine dropped in vacuum, with a sudden pull up that strained every stay."

In a message to the *Daily Telegraph* from "Northern France," on Sunday, Mr. A. Beaumont said:—

"The French aeroplanes have also been active, and they have replied to the German attack on Hazebrouck by dropping bombs on the stations at Lille and Douai used by the enemy, and destroying his convoys. . . . Even when driven a considerable distance from a town the Germans do not give up their hope of destroying it, and when their shells no longer reach it they send their aeroplanes to drop bombs. A few days after the French had succeeded in throwing some shells on the railway station of Freiburg-im-Breisgau, the Germans took revenge by dropping more than half a dozen bombs from an aeroplane on a small town in the north of France twenty miles from the firing line, in which they killed fourteen persons and injured about twenty-five others."

"Two, however, can play at this game, and the German Press itself now mentions that two French or English aeroplanes have again been seen in the Rhine Province, and have been flying over Düsseldorf. No doubt it was not for nothing they went there. We are not told what damage they did to the military structures. In another instance the Germans complain that French aviators flew over an undefended town and dropped bombs. The Germans seem to know nothing whatever of what their aviators have been doing over Paris, where their bombs have killed civilians, as well as at Troyes, and at Amiens, where I myself saw a bomb explode which killed a poor woman, and more recently at St. Omer, Hazebrouck, and Dunkirk."

"The German Zeppelins tried to rival their aeroplanes, and they also have been flying over towns and killing non-combatants. Of late they have abstained, it is true, because of the danger to themselves. The French dirigibles, on the other hand, are only now coming into action. I related some time ago how one of them destroyed a railway junction used by the Germans in the Vosges. A few weeks ago a French airship proceeded at night to another railway junction used by the Germans in the north for the transportation of German troops. The station at the time was filled with trains, with German soldiers, guns and war material. The French dirigible, after hovering over the station, descended to within a convenient distance and dropped explosives on the engine-house, destroying a number of locomotives, and, proceeding a short distance beyond the junction, it dropped other explosives on a viaduct over which German troop trains were passing east and west, and destroyed it also, so that this particular

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The U.S. Navy and Aviation.

IN the programme for 1916 which has been submitted to President Wilson by Mr. Daniels, the Secretary of the U.S. Navy, there is a proposal to appropriate \$5,000,000 for navy aircraft.

Dealing with the matter, the Secretary reports:—

"Aircraft have demonstrated in the present war in Europe that no military arm is complete which lacks them. They will not replace vessels of war, but will extend the field of operations to the air as well as on the surface of and underneath the water. They provide the best means for discovering submarine mines, and have now become an indispensable naval adjunct."

"Orders were given early in the year for some foreign-built aeroplanes, in addition to larger orders for aeroplanes made in this country. Unfortunately, the war made it impossible for the orders placed abroad to be filled, and the trial of such craft must be postponed. The best types of American manufacture have been ordered, and the Department will develop this modern branch of the naval service steadily and rapidly."

"In our present condition of unpreparedness, in contact with any foe possessing a proper air service, our scouting would be blind. We would be without the means of detecting the presence of submarines or mine fields, or of attempting direct attack on the enemy

railway line was put out of service for some time. At another point a French airship discovered an important ammunition centre of the Germans, and, by dropping some melinite bombs on it, succeeded in destroying all the war material accumulated there by the enemy. Two other successful raids were carried out at night by French airships in different places, when they succeeded in destroying the stations and railway junctions utilised by the Germans for the transport of troops and ammunition."

According to news received in Bordeaux on Monday night, a French aviator had set on fire a German train at the station of Pagny-sur-Moselle. Advices were received in Amsterdam from Berlin that French aviators had again dropped bombs on Freiburg.

The following message was sent by a *Daily Mail* correspondent from Flushing on Monday:—

"Two English airmen landed this afternoon at Breskens, on the Scheldt, 15 miles north-east of Zeebrugge. They had been on an air raid over Belgian territory, and had dropped five bombs out of the six which they had taken with them. They were detained by the Dutch authorities, and will be interned."

It was also reported from Flushing that the Zeeland Steamship Co.'s "Oranje Nassau" had landed an officer and a mechanic who had been rescued from a British seaplane which had been sighted floating between the Kentish Knock and Galloper Lightships, having had to come down through engine trouble.

A *Daily Telegraph* correspondent on the coast reported on Tuesday:—

"The British seaplane which had to be abandoned in the North Sea owing to motor trouble has been salvaged by one of our destroyers. It will be remembered that the pilot and observer were taken off by a Dutch steamer after they had been forced to relinquish the idea of returning unaided to the English coast. The machine has been brought into port, and will be repaired."

The Sluis correspondent of the Dutch *Telegraaf* sent the following from Breskens on December 15th:—

"This morning I interviewed the English airman who on Monday landed between Breskens and Nieuwsluis Lighthouse. He left Dunkirk with two others on Monday morning for Bruges, and dropped five bombs intended for the harbour, with the object of destroying a German submarine manufactory. The bomb explosions were clearly audible at Sluis shortly after midday. Subsequently the airman flew in the direction of Zeebrugge. It was foggy when the airman was above the sea, but he succeeded in returning above the land. His machine developed defects, and he alighted in a field. His two companions did likewise, but followed the wrong track, and descended in the sea not far from the English coast. The Zeeland Co.'s steamer 'Oranje Nassau' rescued them from their dangerous situation."

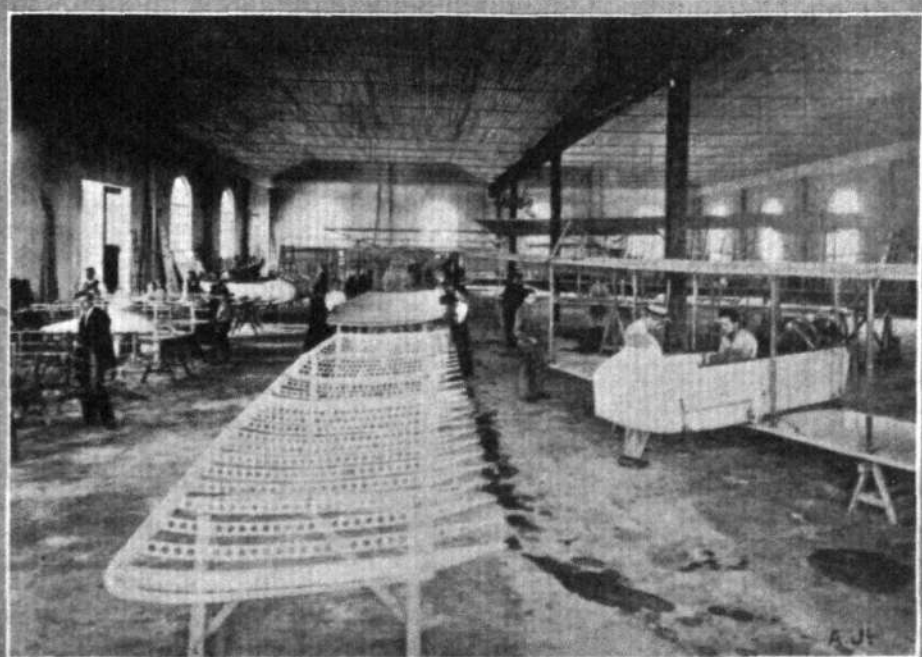
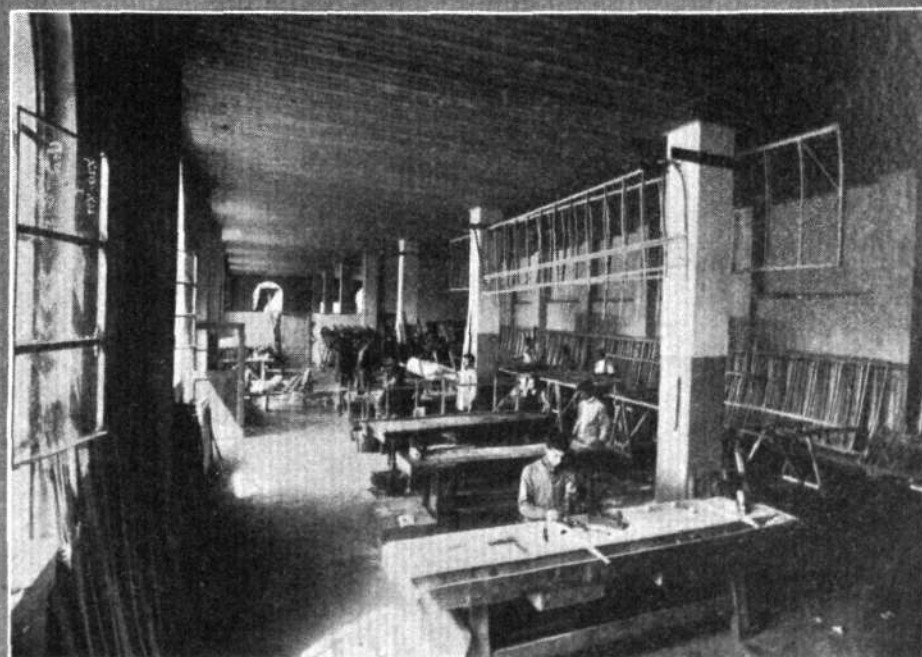
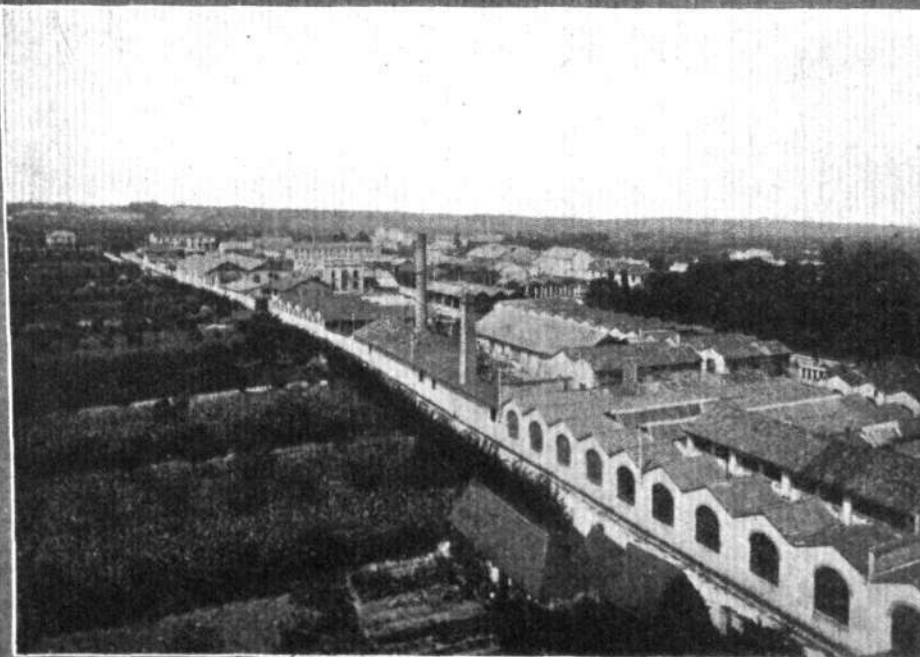
It was reported from Amsterdam on Tuesday that the rescued officer and mechanic left Flushing that morning for England.

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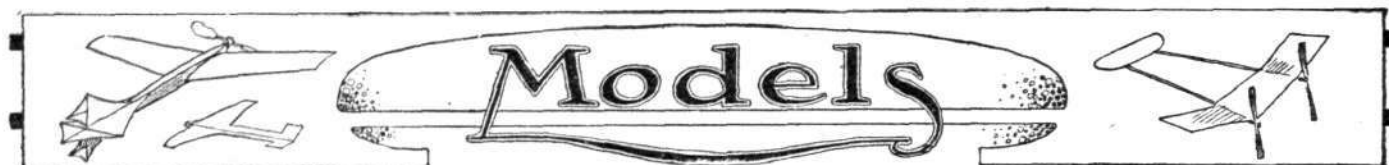
from the air, while our own movements would be an open book to him. The General Board cannot too strongly urge that the Department's most serious thought be given to this matter, and that Congress be asked for an appropriation of at least \$5,000,000 for the purpose of establishing an efficient air service."

The Savoia Co.'s Progress.

WE recently had a chat with Mr. D. Lawrence Santoni, the Managing Director of the "Societa Anonima Costruzioni Aeronautiche Savoia" of Milan, who hold the Italian manufacturing rights for Henry and Maurice Farman machines. The firm have one of the largest aeroplane factories in the world at Bovisio, just outside Milan, with an acreage of 20,000 square metres, and an idea of the arrangements can be obtained from the photographs on the next page. Very large contracts are being carried out for the Italian Government, but should any of the Allies during the war be requiring more machines than can be manufactured in their own countries, the splendidly equipped factory of the Savoia Co. can be utilised to make up any shortage.



THE INDUSTRY IN ITALY. THE WORKS OF THE "SAVOIA" CO. OF MILAN.—In the left-hand top picture the works can be seen, and the other photographs show the carpenter's, erecting and propeller shops.



Edited by V. E. JOHNSON, M.A.

Models Driven by Compressed Air. (Continued from page 1202). The Container or Reservoir.

THE writer has just completed the construction of a small container, cylindrical with hemispherical ends, of the following dimensions and weight:—Length (cylindrical) 26 ins., diameter $1\frac{1}{8}$ th of an inch, total weight 3 ozs. 4 grms. This weight includes an ordinary bicycle valve, a fitting for the use of a pressure gauge, and the tap for the engine. It is constructed of steel, steel piano wire bound, with brass hemispherical ends. I was strictly limited as to the size of the container by the piece of steel in my possession, which was given to me by Mr. Colver when I went to Sheffield some two years ago. The narrow piece of steel band had to be first cut into two equal pieces and then soldered, in order to make a band of sufficient width to form a container of even this small diameter. The thickness of the steel is about $\frac{1}{1000}$ th of an inch, and its weight is about equal to that of thin brass foil of the same size.

I cannot at present say what pressure this container (which is soft soldered) can be safely charged up to; so far it has only been tested with a gauge up to 110 lbs. per sq. in., above which pressure "exertion" becomes necessary—but I should have no fear of charging it up to 150 lbs. One advantage in the use of such thin, light material is that if it does burst there is no "material" of consequence to fly about and hurt you. Before describing how the container was constructed, let us consider for a moment:

The Question of Diameter.

The following formulæ will be found extremely useful in all calculations relating to cylindrical containers with hemispherical ends:—

$$\text{Volume of cylinder} = \text{height} \times \text{area of base} = h \times \frac{22}{7} r^2,$$

where h = height of cylinder,
and r = radius of circular base.

$$\text{Volume of sphere} = \frac{4}{3} \cdot \frac{22}{7} r^3,$$

where r is the radius of the sphere.

$$\text{Lateral surface of a cylinder (excluding the ends)} = \text{height} \times \text{circumference of base} = 2 \cdot \frac{22}{7} r \cdot h.$$

$$\text{Surface of a sphere} = 4 \cdot \frac{22}{7} r^2.$$

If we double the length of our cylinder, we obviously double the volume, but we also double the weight; if, instead of doubling the length, we double the diameter, we double the material, but we have *four times* the volume, since the areas of the circular bases are to one another as the squares of their diameters, i.e., if we take two cylinders, both 3 ft. long, one 1.5 in. in diam. and the other 3 ins., then the latter has only twice the weight, but four times the volume, of the former. This shows us how important it is to let the diameter be as large as possible. Some early French models on the market were fitted with *two* cylinders of equal size, placed one above the other. This principle was clearly a wrong one, because the weight was doubled as well as the volume.

One cylinder of a diameter to give double the volume of the original cylinder should have been used.

If d be diam. of the original cylinder, and D of one we desire to have twice the volume, then we have $D = d \sqrt{2} = d \times 1.42$ approx.

It will thus be seen that the container described in our issue of December 4th, has about three times the capacity of the writer's. I do not know the weight of the larger container, or the motor, described in that issue, but it has been on the market for some time, and undoubtedly some readers of FLIGHT possess this plant, and could, perhaps, supply the information, together with any results obtained or experiments that they have made.

The Construction of a Compressed Air Container.

The following method was employed by the writer in the construction of the 3 oz. 4 gramme reservoir, and since it answered well in this case, and is one which can be made use of in other instances, we give fairly full details:—

After the steel band was cut and soldered together again as already described, a piece of wood some 27 ins. long was turned up in a lathe until its diameter was such that, when the steel band was wrapped round the wood, its edges overlapped to the extent of about $\frac{1}{16}$ th of an inch. The wood was smoothed down and rubbed with blacklead and the steel oiled (on the inner side), it was then

wrapped round the cylinder of wood, tied at intervals and then soldered carefully all down the join. It was then slipped off the wood just to examine it; it had been fitted rather too tightly and only came off with difficulty. A fine cut was taken off the wood before replacing the steel cylinder on it. The cylinder was then wrapped with No. 26 steel piano wire from end to end, the distance between the coils being about $\frac{1}{16}$ th of an inch; each coil was soldered to the cylinder twice every time, in the same place as where the steel was already soldered together. About a foot of wire was left over at each end. The two ends were hemispheres of brass, taken from two $2\frac{1}{2}$ d. light brass knobs, one was soldered to the steel cylinder whilst it was still on the wood, which was then withdrawn, and the other half knob then soldered on; the wire ends were then wrapped round a ridge in the hemispheres and soldered, and the ends passed round and fastened to the bicycle valve and tap, which had previously been soldered to the top or summit of the dome-shaped knobs before fixing these latter to the cylinder. Only that portion of the bicycle valve which was absolutely necessary was used, the rest being dispensed with or sawn off with a hack saw. The tap was a light ordinary one, and was, as a matter of fact, part of the whistle of an old small toy locomotive.

Testing for Air-tightness.

Having completed the construction of the container, it was necessary to look for leakages. A V-shaped metal trough was next constructed, in which the reservoir, whilst still connected with a bicycle foot pump (previously tested for leakages and remedied), could be placed. About a pint of paraffin was poured into the trough; water was not used on account of its rusting properties.

Several leaks were found and remedied, until finally there only remained a very slight leakage at the tap, which was not cone-shaped and could not be properly tightened up. The particular thinness of steel with which the above was constructed cannot be obtained commercially, the small coil from which the little piece given to the writer was cut was valued at some £15 odd, but copper or brass foil can easily be obtained, and although these (if of equal weight) would not have more than half the strength, if that, of steel, still if well wrapped with steel wire, I see no reason why such cannot be safely used up to a pressure of 110 or 120 or even 150 lbs.

The hemispherical ends are of great strength, in order to prevent the ends blowing out entire, and to further strengthen the container, a piece of steel piano wire of about 20 gauge should pass through the cylinder from end to end, out at or near the dome summits at both ends, and be securely fastened either round or to suitable fittings, such as the valve and tap. It is extraordinary how rigid one of these fine tubes are when completed, and there is no trouble on that score at all.

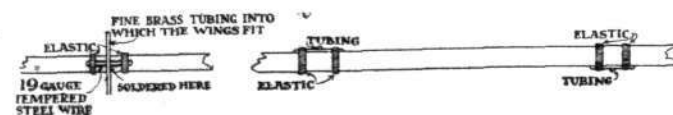
The above container is being fitted with planes, chassis, engine, &c., and the model (which comes out in about the nature of a 9-oz. weight only) is nearly completed. Unless anything unforeseen occurs it will be illustrated and described in the next issue.

(To be continued.)

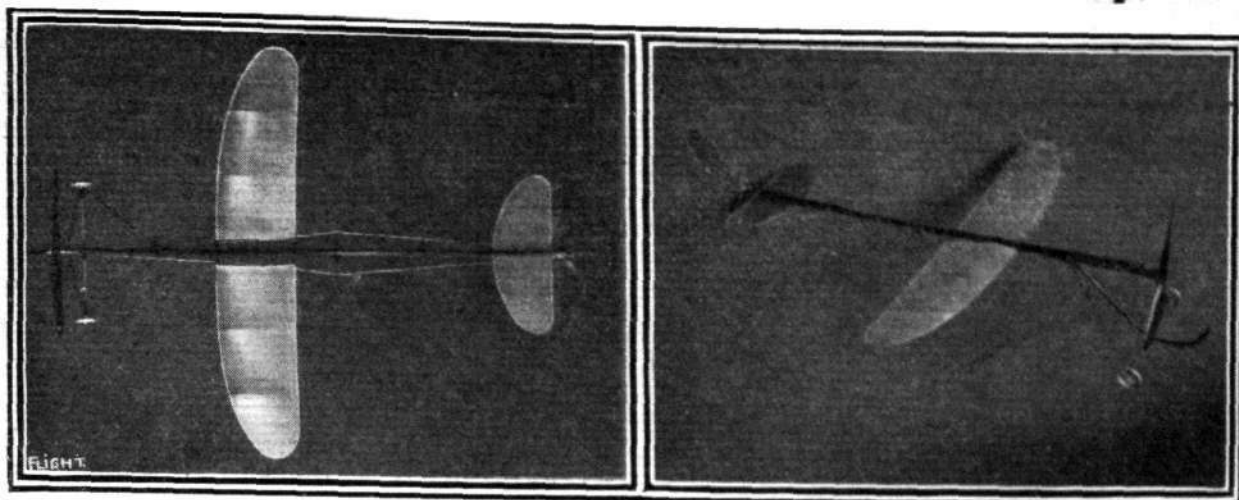
A Single-screw Self-rising Tractor.

By JAMES C. BALDEN (Scottish Aero Soc. Model Aero Club).

	Weight.
Main plane, 25 ins. by $5\frac{1}{2}$ ins. (gap in centre of $1\frac{1}{2}$ in.)	$\frac{3}{4}$ oz.
Tail plane, 10 ins. by 4 ins.	$\frac{1}{4}$ "
Rudder plane, $5\frac{1}{2}$ ins. by 3 ins.; body, 33 ins. by $\frac{3}{8}$ in. by $\frac{1}{4}$ in.; chassis, 19 gauge tempered steel wire, $\frac{1}{4}$ -in. round cane, and $\frac{1}{4}$ in. by $\frac{1}{8}$ in. flat cane;	
wheels, aluminium, $1\frac{1}{8}$ in., distance apart $8\frac{1}{2}$ ins.	$2\frac{1}{2}$ ozs.
Propeller, 10 ins. by $1\frac{1}{4}$ in., Murray, Sons and Co.	$\frac{3}{8}$ oz.
Pitch, $12\frac{1}{2}$ ins., approx.	
Rubber, 6 strands, $\frac{1}{16}$ -in. strip	$\frac{1}{2}$ "
	$4\frac{1}{2}$ ozs.



Method of attaching wings (on left) in Mr. Balden's single screw tractor, and on right elevation showing how angle of incidence is obtained.



An r.o.g. single screw tractor by J. C. Balden, from two points of view.

The Paddington Club and Research Work.

Mr. D. Robertson (Dundee), writes as follows, with respect to the above:—

"With regard to the letter of Mr. W. E. Evans, of the Paddington Club, in your issue of December 4th, and his proposed experiments, I should think it already known that large diameter, small pitch propellers, were more efficient than small ones with large pitch. I experimented with propellers on one of my models about two months ago, with the following results. The dimensions of the model (and weights as far as I can remember) were as follows:—A frame 40 ins. long = $1\frac{1}{2}$ ozs.; main plane, 27 ins. by 5 ins. = 13 drams. Elevator, 9 ins. by $2\frac{1}{4}$ ins. = 3 drams.; Rubber, 4 strands per side of $\frac{1}{4}$ in. strip per side = about $1\frac{1}{2}$ ozs. Total, including stay wires, elevator attachment and propellers, nearly 5 ozs. Three pairs of propellers were tried: 9 in. Star carved Levasseur type; 9 in. steamed (own make) usual type; and $9\frac{1}{2}$ in. steamed Twining propellers. The first two pairs were of 20 in. and 24 in. pitch respectively. The Twining pitch I don't know, but the tips were almost in line with each other. The two latter pairs were running about same speed, the Stars rather faster. The first two pairs were tried about six times without anything like a decent duration. Nothing above 60 secs. With the Twining propellers, at first attempt, with 1,100 turns (I could easily have got more), the model climbed steadily till slightly over 60 secs. At 65 secs. it disappeared into the topmost trees on top of a wooded hill outside the park where we were experimenting. We could not find it, as the trees were in full foliage. I had had these Twining propellers for four years. About two years ago I had them on a model which weighed 6 ozs., 40 ins. long, 30 ins. span, 4 strands $\frac{1}{4}$ in. strip per side. The first flight landed it in the top branches of a very high tree, at 30 secs., when still climbing, but this model was not continued with for various reasons. The blades of these Twining propellers were only about $\frac{1}{2}$ in. in width.

"I would be obliged if you would inform me if the Twining Aeroplane Co. is still in existence, as I would like more of their propellers." [So far as I know it is not.—V. E. J.]

"Mr. Evans mentions experimenting with planes to get a satisfactory camber. Does not the fact that the N.P.L. find by model experiments that a camber of $\frac{1}{8}$ th chord at $\frac{3}{4}$ th chord from leading edge is the best all round camber to satisfy model makers? Large cambers are unsatisfactory."

Aeromodellists Serving with the Colours.

We shall be glad to receive the names and particulars of further model workers serving with the Colours. So far not a single name has been sent us from quite a number of clubs, including even the K. and M.A.A., which must have surely quite a number of members so engaged.

Mr. Leslie G. Ryley writes: "Noticing your intimation in FLIGHT re the above, I shall be glad if you will include Private S. B. Shorter, 7th Battalion, R.W. Regiment, A Company, of the Coventry Aero Club, now billeted at Witham, Essex."

Mr. W. H. Norton, Hon. Sec. Reigate, Redhill and District Aero Club, sends us the following communication: "A week or two ago you mentioned that you would like a list of aeromodellists who were serving with the Colours. I therefore beg to forward the following names of those connected with this club:—

J. W. Burghope, 5th Battalion (The Queen's), R.W. Surrey Regt.
G. Morris, 5th Battalion (The Queen's), R.W. Surrey Regiment.
H. Jordan, 5th Battalion (The Queen's), R.W. Surrey Regiment.
C. Jordan, 5th Battalion (The Queen's), R.W. Surrey Regiment."

From Mr. P. W. Peel, Hon. Sec., South Western Aero Club we have received the following names:—

V. Drake, Royal Bucks Hussars.
F. Miller, Royal Army Medical Corps.
D. Prodder, Royal Naval Air Service.
R. Bell, Royal Naval Air Service.
C. Holmes, Westminster Dragoons.
W. Turner, 6th London R.F.A.

Mr. D. Robertson (Dundee) sends us the following list of aeromodellists (of, we presume, the Dundee Model Aero Club) now serving with the Colours:—

Lieut. Ian M. Luis, Royal Engineers.
Private James McLaren, Royal Fusiliers.
Private William Stuart, R.F.A.

Query.

W. G. Bettell, 1, Ventnor Terrace, Broad Lane, Tottenham, desires to know if there is a model club in Tottenham. If not, our correspondent would be very glad of a few hints as to the best way to establish one.

Reply to J. Chapman.

A 2 ft. 6 ins. to 2 ft. 9 ins. propeller. It depends entirely on your speed and motor and the total weight of your machine.

**KITE AND MODEL AEROPLANE ASSOCIATION.****Official Notices.****British Model Records.**

Single screw, hand-launched	Duration ...	J. E. Louch	... 95 secs.
Twin screw, do. ...	{ Distance ...	R. Lucas	... 590 yards.
	{ Duration ...	T. D. Collingwood	
		Chown	... 145 secs.
Single screw, rise off ground	{ Distance ...	W. E. Evans	... 290 yards.
	{ Duration ...	J. E. Louch	... 66 secs.
Twin screw, do. ...	{ Distance ...	L. H. Slatter	... 365 yards.
	{ Duration ...	J. E. Louch	... 2 mins. 49 secs.
Single-tractor screw, hand-launched	{ Distance ...	C. C. Dutton	... 266 yards.
	{ Duration ...	J. E. Louch	... 91 secs.
Do., off-ground	{ Distance ...	C. C. Dutton	... 190 yards.
	{ Duration ...	J. E. Louch	... 94 secs.
Single screw hydro. off-water	{ Duration ...	L. H. Slatter	... 35 secs.
Single-tractor, do., do.	{ Duration ...	C. C. Dutton	... 29 secs.
Twin screw, do., do.	{ Duration ...	S. C. Hersom	... 65 secs.
Engine driven off grass	{ Duration ...	D. Stanger	... 51 secs.

Official Notices.—On Saturday last Mr. A. F. Houlberg attended at the Bishop's Avenue Flying Ground, but owing to a breakdown on the trams, and no doubt also owing to the inclemency of the weather, none of the intending competitors turned up. I have received a letter from the Aero Models Association pointing out the almost impossible circumstances of attempting any records at the present moment, and it has been agreed, as far as they are concerned, to postpone this matter for a month or two.

All communications to be addressed to H. A. Lyche, 95, East Sheen Avenue, East Sheen, S.W.

AFFILIATED MODEL CLUBS DIARY.

Club reports of chief work done will be published monthly for the future. Secretaries' reports, to be included, must reach the Editor on the last Monday in each month.

Leytonstone and District AeC. (14, LEYTONSTONE RD., STRATFORD)

Now that the wet season has set in members will meet in club-room, Sunday mornings, at 211, Dames Road.

UNAFFILIATED CLUBS.

Liverpool Aero Research Club (62, CEDAR GROVE, LIVERPOOL).

DEC. 25TH, postponed Trophy Competition at 2.30 p.m. prompt; Dec. 26th r.o.g., any type competition for cash prize. General meeting, 22, Eton Street, Dec. 30th, at 8 p.m.

The two Gnome-engined Avros which returned to France after taking part in the raid on the Zeppelin works at Friedrichshafen have been brought back to England for overhaul. In the accompanying photograph is seen, full size, a souvenir of the visit—a piece of fabric from one of the wings—and the peculiar shape of the hole made by the bullet should be noted. While the left-hand edge is shaped to the nose of the bullet, on the opposite



ch were used for the air raid upon Friedrichshafen.

side the material is crushed; it is probable that at the height at which the machine was struck, the vertical velocity of the bullet was small, and in consequence of the forward velocity of the aeroplane, the bullet was caused to deviate from its original path and to continue its movement, more or less, broadside on.

Apropos of the question of the need for a badge to be worn by those who are engaged in the production of material required by the Army or Navy, a correspondent writes suggesting that the R.A.F. badge, as well as others which have been issued, are very similar to badges worn by members of cycling clubs, &c., and on that account are not conspicuous enough to effect the end in view. He suggests that an armlet such as has been adopted by the Bristol Co. would be preferable to badges of the button-hole type.

Since the beginning of November the employees of the Aircraft Manufacturing Co. have collected £36 towards the fund organised by Lady Henderson for the benefit of the Royal Flying Corps at the front.



CORRESPONDENCE.

The Price of Patents.

[1893] It may perhaps be of interest to many of your readers to learn that by a notice appearing in the "Illustrated Official Journal (Patents)" of to-day's date, the price of printed specifications of inventions is to be reduced from 8*d.* to 6*d.* per copy including inland postage.

It may be recalled that when the Government first printed specifications of inventions the charge per copy varied according to the number of pages of letterpress and the number of sheets of drawings, the result being that in some cases a copy of a single specification cost as much as £1 or £1 5s. When the uniform charge of 8d. was introduced, this charge applied to all specifications including those previously published at much higher prices, and the new charge of 6d. will also apply to all specifications.

BROWNE AND Co.,
Patent Agents.

9, Warwick Court, Holborn, London W.C.

SPECIAL NOTICE.

CHRISTMAS HOLIDAYS.—Owing to Christmas Day and Boxing Day falling on Friday and Saturday next week, it is necessary for **FLIGHT** to close for Press on December 22nd. All copy, Editorial or Advertisement, must therefore be at the Office, 44, St. Martin's Lane, W.C., not later than first post December 21st.

ENEMY PATENTS RELATING TO AERONAUTICS.

THE following list of British patents which have been granted in favour of residents of Germany, Austria, or Hungary, is furnished in view of the new Patents Acts, which empower the Board of Trade to grant licences under certain conditions to British subjects to manufacture under enemy patents, and is specially compiled for FLIGHT, by Lewis Wm. Goold, Chartered Patent Agent, Enrolled Patent Attorney in the United States, 5, Corporation Street, Birmingham. It is desirable in the first instance to obtain a full copy of the patent specification (price 8d. each patent), and also the latest particulars upon the Patents Register. If any patent listed has been assigned to a non-enemy proprietor, the law does not apply.

No. 19976/11. Aerial machines, without aerostats; planes, construction of; steering and balancing. The car carrying the motor and aviator are suspended from the frame of an aeroplane by a universal joint, and the lateral and longitudinal swing of the car relatively to the upper plane-carrying frame actuates the balancing-planes. Wiese, J., Germany.

No. 21130/11. Steering and balancing. In an automatic-balancing device for flying machines, the piston for actuating the rod connected to the balancing planes is normally held in central position in the cylinder by collapsible air-chambers, which are expanded by compressed air admitted through a valve, and means are provided for exhausting one or other of the air-chambers when the balancing-planes are operated by hand for steering. Willems, K., Germany.

No. 23585/11. Propelling and steering. The flapping wings of flying-machines are provided at the inner end of the operating arm with a crank, one end of which moves to and fro along a curved or straight line, and the other around a closed curve so as to produce a flapping and feathering motion of the wing. Means are provided for varying the plane of action of the wing. The length of the crank on the wing arm may be varied to modify the feathering motion of the wing. Hassenbach, H., Germany.



NEW COMPANY REGISTERED.

General Aeronautical Co., Ltd., 30, Regent Street, S.W.—Capital £2,000, in £1 shares. Manufacturers, patentees of and dealers in aeroplanes, airships, balloons (whether dirigible or otherwise), aeronautical apparatus, &c.



Aeronautical Patents Published.

Applied for in 1913.

Published December 17th, 1914.

27,315. E. T. WILLOWS AND WILLOWS AIRCRAFT CO. Propeller gearing for ships.

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